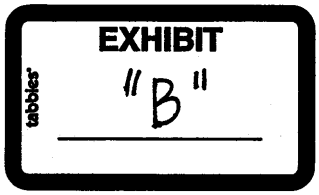
IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	)
Plaintiff,	)
vs.	) 4:05-CV-00329-TCK-SAJ
TYSON FOODS, INC., et al,	)
Defendants.	)

- -

VOLUME I OF THE VIDEOTAPED DEPOSITION OF CHARLES COWAN, PhD, produced as a witness on behalf of the Plaintiff in the above styled and numbered cause, taken on the 17th day of February, 2009, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.



Q Okay, and can you tell me what the general nature of that litigation is involving?
A Sure. When -- several years ago UPS bought Mailboxes, Etc. Several of the franchisees for Mailboxes, Etc., felt that the purchase wasn't in their best interest, that they weren't being adequately compensated or represented by the new combined entity, and so they are suing for lost profits and lost business opportunities. 09:12AM
Q And that case does not involve environmental matters; correct? 09:12AM
A No, it does not.
Q Have you ever been deposed in a case that involves environmental matters?
A Several times. 09:12AM
Q Okay. Could you identify those for us, please?
A Sure.
Q And when you do that, if you could just tell us the type of environmental issues involved briefly, that would be help -- be helpful. 09:12AM
A Sure. Most of the cases have involved groundwater or airborne contamination around a plant or a -- some other type of facility that had some type of discharge. In those cases, the contaminant 09:13AM

was typically something like fertilizer that had leached into groundwater, had been spreading over time, and the claims were that the contamination diminished the value of properties that were in the path of the groundwater. 09:13AM
Q And was your role an economic analysis or an environmental analysis in those cases?
A Economic.
Q Have you had any cases where you've actually done an environmental analysis as an expert? 09:13AM
A No.
Q So this is your first case where you've done an environmental statistical analysis as an expert?
A I'm not sure how to understand your question.
Q Well, I just -- you testified that the four or five cases that you've been deposed involving groundwater and airborne contamination, you were doing an economic analysis for the litigants in that case; correct? 09:14AM
A Yes. 09:14AM
Q In this particular case, are you doing an economic analysis?
A No.
Q Okay. Aren't you evaluating statistically the environmental data that's associated with the claims 09:14AM

in this case?
A No.
Q What are you doing in this case?
A I'm evaluating the quality of the statistical analysis that was done by Dr. Olsen. I'm not doing a separate statistical analysis. 09:14AM
Q Okay.
A And then to answer the first question you asked, in each of those cases, I had to determine what was the environmental impact, what was the spread of the contaminants. Plus, you didn't allow me to finish my description. So in those cases, you couldn't do the economic analysis absent any knowledge of what the environmental contamination was. 09:14AM 09:15AM
Q But in those cases, and I'm just trying to broad brush it. If not, we'll go individually. In those cases, were you personally evaluating the sources of contamination and the scope and extent of the contamination? 09:15AM
A No.
Q So you relied on the statements of other experts and then did your evaluation; correct?
A I did.
Q Okay. So what I'm trying to hone in on here, 09:15AM

Dr. Cowan, is whether or not this case is the first time that you've actually evaluated the environmental data from a statistical perspective?
A And I just answered that question and said no, it's not. In each of the other cases I had to evaluate the environmental data that I was given and work with hydrologists and experts like that to be able to determine what they were telling me and what their analysis was before I could conduct my analysis. 09:15AM 09:15AM
Q In these previous cases, did you actually critically review the environmental data; that is, did you look at the statistical analysis provided by the experts that were identifying sources in those cases and do a critical review in those cases? 09:16AM
A I did because, otherwise, I couldn't know how valid or reliable my economic analysis was.
Q Okay. Would you tell me about the first case in the most recent past that involved either -- you said there was four or five, so let me go through those. Let's go from the most recent and go backwards. Okay? 09:16AM
A Okay.
Q So what would be the most recent case you've -- involving environmental contamination you've 09:16AM

A Florida.
Q Florida, okay. And what was your role in that case, sir?
A I was supposed to determine whether or not the cleaner had been deceptive in the way that they worked with both the State and with their consumers. So it was a deceptive sales practices case in terms of how they worked with the State and the consumer in the way they dealt with the contaminants that would result from dry cleaning. 09:36AM
Q Okay. Did your work in that case involve an evaluation of the scope and extent of contamination?
A No.
Q Do you recall where the contamination was in that case? 09:36AM
A Well, what I said was --
Q It was more a record keeping kind of a case; is that what it was?
A It was more of a record keeping case because it was every dry cleaner for this large corporation, 09:37AM but we're talking about hundreds of locations.
Q So your evaluation was more of a records analysis to see if they properly reported their disposal or management of their cleaning fluids?
A No. It was actually how they dealt with the 09:37AM

State in terms of the reporting to the State about the costs for remediation, what they had done to adhere to state law and then how they dealt with that in their pricing for consumers.
Q But was it mostly evaluation of their records -- of what they told the State through their records? 09:37AM
A Well, told the State and then told consumers also. So there was two different sides to this.
Q But just to make sure, it did not involve an evaluation of the contamination at these particular dry cleaning locations? 09:37AM
A No.
Q Any other cases involving environmental matters? 09:37AM
A Not that I recall.
Q Okay, and the fifth case we just talked about, is that reported in your CV, sir?
A I believe it is.
Q Can you show me where? 09:38AM
A Yes, sir. Page 70.
Q Under deceptive sales practices?
A Yes, sir, the second one, Watkins versus Dry Cleaners International.
Q Looking through your CV, I just don't sense 09:38AM

that there's a lot of experience you have working with contaminants in the environment. Is that a fair characterization?
MS. HILL: Object to form.
A Of course, that wasn't why I was hired, so -- 09:38AM
Q Can you answer the question yes or no?
A No, there's not a lot of experience dealing with the determination of environmental contaminants and their sources.
Q Other than the description of these five cases 09:38AM that you just provided us, can you tell me if you have any other experience, whether it's involved in a case or not, not necessarily litigation -- I'm trying to look at experience beyond litigation -- where you've done evaluation of datasets that 09:39AM involve geochemical or environmental data?
A If you -- are you using the -- I understand the geochemical. Are you using environmental in the narrow sense of relating to how it affects the earth as opposed to environmental in terms of sociological 09:39AM concerns?
Q Yes, sir.
A Okay. Then, no, I have not had any other involvement.
Q Okay. So this would be your first case where 09:39AM

you evaluated such a dataset as in this case?
A Well, keep in mind, I didn't evaluate the dataset. I evaluated Dr. Olsen's work.
Q Well, you did, though, did you not, comment on whether or not Dr. Olsen's dataset was reproducible; 09:39AM correct?
A Yes, I did.
Q Okay. So I guess let me restate the question this way: Is this the first time -- I hope there's no underlying -- I'm trying to make this as simple 09:40AM as possible. Is this the first dataset that you've evaluated that deals with environmental data defining environmental data the way you just did?
A Okay. Well, I want to be able to distinguish between evaluating the data itself, which I didn't 09:40AM look at, versus evaluating Dr. Olsen's data because he constructed his datasets from that original dataset.
Q Okay. Let me ask you this question then. Maybe this is a better question. Is this the first 09:40AM case where you've done a review of statistical analysis of how another expert did statistical analysis on an environmental dataset?
A Yes, it is.
Q Thank you. I knew if I got enough tries, I 09:40AM

of drugs that are used, the care that the mother gets before the birth, the -- whether or not there is -- the mother breast feeds the baby, all the different sources of or the transmittal channels where a newborn can get AIDS from its mother, and in that case, I'm working with a team of pediatricians, oncologists and a variety of other doctors, but I was brought on board because they needed a statistician to coordinate the project. 09:47AM

Q And sometimes I interrupt, Dr. Cowan, because I'm thinking maybe we didn't communicate initially. **09:47AM**

A Yes, sir.

Q I think my original question was, have you done any studies in the ambient environment? Do you understand what an ambient environment means? **09:47AM**

A Could you define it for me?

Q Well, that would be outside, for example, in the fields and forests of the IRW, the Illinois River watershed.

MS. HILL: Object to the form. 09:47AM

Q That's what I mean by ambient environment.

A Well, I'm sorry. I have trouble distinguishing that between being in a city or a rural environment where -- I mean, I'm dealing with an entire country, like Zambia, where some people 09:47AM

live in the city, some people live outside, but I would consider everybody to be in an ambient environment if they're giving birth.

Q But those issues you are dealing with there, both in Africa and in Peru, isn't the focus person-to-person spreading of the disease? **09:48AM**

A Well, it may or may not be depending on, first of all, the disease because tuberculosis --

Q Well, yes or no?

A Okay.

Q Is the answer then no?

A Well, I was trying to give you an answer that indicated that there is no yes or no.

Q Okay. Were those two studies primarily epidemiological studies; would you characterize them as that? **09:48AM**

A I'm going to fall back to the answer I gave before on the other studies. It's a combination of epidemiology and demography.

Q Okay. Did you read Dr. Harwood's report in this case? **09:48AM**

A Yes.

Q Okay. Would you -- what I'm trying to understand is if you ever reviewed any source tracking evaluation such as Dr. Harwood did in this **09:48AM**

case in her report.

MS. HILL: Object to the form.

A Well, I have trouble distinguishing between what Dr. Harwood did in terms of her research and what I do in my research. I mean, if you're trying to make it very specific to looking at a field or a set of fields as opposed to just a general environment, if you are talking about environment -- environmental spread, then I don't see a distinction. 09:49AM

Q You don't? Well, let me ask you this question: Do you not see a distinction between the spread of disease from, for example, human or animal manure being spread on fields as opposed to the type of studies you're doing in Africa and Peru currently? **09:49AM**

MR. TODD: Object to form.

A Well, mathematically, no.

Q Okay, but the method -- the means of transport of the microbes are substantially different; correct? **09:49AM**

A But I -- that's not my responsibility in terms of the research.

Q I understand that. That's what I'm trying to understand. **09:50AM**

MS. HILL: David, would you let him finish, please?

MR. PAGE: Thank you.

MS. HILL: You're stepping all over each other. 09:50AM

A And I guess we should both apologize to Lisa. What I'm saying is that my contribution here in this case is similar to my contributions in all the research studies I've designed, which is I help evaluate whatever the pathway is, but I do it through mathematical modeling. 09:50AM

Q Okay. So you don't understand the mechanisms of bacterial source transport in the environment, do you, sir?

A Well, once again, it sort of depends on what it is we're talking about. At some point to be able to talk about the transport of the tuberculosis, I have to understand what the pathways are there and how one person can contaminate another because there's multiple pathways. 09:50AM 09:51AM

Q Do you consider yourself a microbiologist?

A No.

Q Do you consider yourself an expert in bacteria?

A No. 09:51AM

Q Have you ever designed any field sampling work to collect bacteria?
A No.
Q Have you ever designed any field sampling work to collect bacteria from manure samples? **09:51AM**
A No.
Q What about land-applied fields where manure has been spread?
A No.
Q What about surface waters? **09:51AM**
MS. COLLINS: Object to form.
A No.
Q Groundwater?
A Well, working with the hydrologists and describing what was needed for a representative 09:52AM sample, yes.
Q But not actually written protocols for how to sample groundwater?
A No.
MS. COLLINS: Are you specifically talking 09:52AM about bacteria still?
MR. PAGE: Yes, ma'am. All those questions were related to bacteria.
A No.
Q Would you turn to Page 40 of your report, **09:52AM**

please, Footnote 16 that's on Exhibit 1. Could you read Footnote 16 for the Record, please?
A Dr. Olsen throughout his report confuses the terms parameter and variable. In this sentence he used one to explain the other. From context, it 09:52AM seems Dr. Olsen means variable when he says parameter. A parameter is the single value which describes characteristics of a population, like an arithmetic mean or a variance. A variable is the theoretical construct used to denote a value that 09:53AM can change according to the sample being observed. These are not interchangeable terms.
Q What is your concern here in Footnote 16?
A Well, the -- if you would give me one second so I can go back up to the Paragraph 87. Okay. In 09:53AM this sentence that I'm quoting from Dr. Olsen's report, he says that he is calculating a PC score using the PC coefficient multiplied by the standardized parameter concentration. This is performed for all parameters, parenthesis, 09:54AM variables, in a particular PCA run. So he uses both terms simultaneously to describe the activity that he's doing, but parameters and variables mean two completely different things.
Q So how was Dr. Olsen using them **09:54AM**

inconsistently?
A Well, because you would either perform this calculation on one or the other.
Q And what would be the difference?
A Well, if you're multiplying parameters, you're 09:54AM multiplying -- using parameters the way Dr. Olsen was using parameters, you're multiplying a single number. If you're multiplying variables, you're multiplying all of the observations within one specific variable. So you could be multiplying -- 09:54AM you could be doing 597 multiplications instead of a single multiplication.
Q Aren't we talking about the individual chemicals observations when we talk about a parameter in this report, Dr. Olsen's report? **09:55AM**
A No. A parameter is -- in Dr. Olsen's report is what it is that he's trying to estimate. A variable is a, what you just said, a particular chemical.
Q So it's your contention that when Dr. Olsen used the term parameter, he was using it as a statistical term and not as a term as environmental scientists typically use that term? **09:55AM**
MR. TODD: Object to form.
A In the context in which he was using it, yes. 09:55AM

Q And how do you know what was in his mind?
A Well, I don't know what was in Dr. Olsen's mind. What I'm indicating is that relative to the standard usage of the term, you can't have both at the same time. 09:55AM
Q But I think you previously testified this is the first environmental dataset you've evaluated from a statistical perspective; correct?
A Yes.
Q Are you familiar what the USGS is? **09:56AM**
A Yes.
Q What is the USGS?
A U. S. Geological Survey.
Q And let me show you what's been marked as Exhibit No. 2 to your deposition. Can you identify **09:56AM** **that document for the Record, sir?**
A It is -- seems to be a web page. At least the cover is a web page from waterdata.gs.gov that describes what you have helpfully highlighted as parameter help. 09:56AM
Q Okay. Could you read under the announcement statement that I've highlighted there for you, sir?
A Sure. There have been changes to parameter names in the National Water Information System, Parameter Code Dictionary. These changes have been 09:57AM

incorporated in NWIS web. This is May 2003.
Q Okay, and when you look at, for example, on Page 2 of the exhibit, can you identify, sir, in what sense the USGS documents using the word parameter? **09:57AM**
A They are using it to describe variables.
Q Using it to describe variables?
A Yes.
Q And that's exactly how Dr. Olsen used the term; correct? **09:57AM**
A Well, not exactly because here the word variable isn't appearing anywhere. So apparently USGS calls them parameters, but they don't use both terms.
Q Okay. Well, Dr. Olsen used variable parenthetically to make sure there was an understanding that, in at least the scientific community for environmental scientists, parameters and variables mean the same thing; correct? **09:57AM**
MS. COLLINS: Object to form. 09:58AM
A Well, I understand that that's your allegation. I don't know what was in Dr. Olsen's mind.
Q Well, isn't that also how USGS is using that term? **09:58AM**

A Not on this page.
Q You just testified that USGS is using the term as you would use the word variable; correct?
MR. TODD: Object to form.
A Okay. You're asking me something slightly 09:58AM different. I just indicated a minute ago that they used the word parameter to substitute for variables.
Q So do you believe that USGS is likely using the word parameter in the same way that Dr. Olsen uses the word parameter in his report? **09:58AM**
A It's possible.
Q I have a question. Would you turn to Paragraph 3 of your report, sir?
A Okay. I'm sorry. Do you want me to keep this or would you like me to give it to -- 09:59AM
Q We can just set it right here in front of you.
A Yes, sir.
Q And then sometimes we go back to previous exhibits.
A Okay, and I'm sorry, where would you like me 09:59AM to turn now?
Q Paragraph 3.
A Okay, sir.
Q Would you read Paragraph 3 for me, please?
A I'm sorry. I'm not there yet. 09:59AM

Q I think it's on Page 2 of your report.
A Yes, sir. I'm currently an adjunct professor in the School of Public Health at the University of Alabama Birmingham and previously served as a professor in the business school at UAB, as a 09:59AM visiting research professor at the University of Illinois, and in other academic and professional positions.
Q So you currently hold the position as an adjunct professor at the University of Alabama; is that correct? **09:59AM**
A Yes, sir.
Q You had previous positions at the University of Illinois and also another different position at University of Illinois; is that correct? **10:00AM**
A Yes, sir.
Q What is the last time you taught a class at University of Alabama Birmingham?
A Well, are you talking about large classes or are you talking about dealing with graduate 10:00AM students?
Q Why don't you tell me.
A Okay. Well, three weeks ago I met with one of my doctoral students at the University of Alabama Birmingham to discuss her research in the Honduras 10:00AM

regarding the transmission of tuberculosis through different sources, like textile factories versus other places.
The month before that I was working with another of my doctoral students who was finishing 10:00AM her dissertation on the impact of the caste, C-A-S-T-E, system on neonatal care in northern India, and last August I was working with Scott Keeter, who's now a professor at a university in the northeast. He was finishing his dissertation on the 10:01AM analysis of eleven different surveys for measurement of obesity.
So during the past year, I have worked with four different, four or five different doctoral students, and the last time I taught a class, a 10:01AM large class at UAB was either two or three years ago I taught the graduate level sampling theory.
Q Sampling theory?
A Uh-huh.
Q For public health? **10:02AM**
A Well, it was in the department of biostatistics.
Q Okay, and so would you -- how would you characterize your current function as a professor at the University of Alabama Birmingham? **10:02AM**

A Well, I still have, I believe, four doctoral students working with me on different types of projects. I'm a co-PI, principal investigator, on two different research studies, one that started at UAB on the measurement and spread of obesity. The other one at Johns Hopkins University on -- dealing with issues of obesity in Hispanics, and I'm also a part-time editor for the Journal of Obesity. 10:02AM

Q Who retained you in this case?

A Actually that's a little hard to answer because I'm not sure how you would characterize them, but it was this ensemble of attorneys through the joint defense. 10:03AM

Q Who is paying your bills?

A Ozark. 10:03AM

Q Ozark?

A Ozark, Ozark Management.

Q And what is that?

A Apparently it is a company that was retained by the joint defense counsel to manage the billing process. 10:03AM

Q Have you ever worked with any of these counsel in the past?

A With Mr. Jorgensen.

Q And what cases have you worked with him in the 10:03AM

past?

A It was also a case involving -- excuse me -- Tyson Foods, and it was to look at a case that was filed by the U. S. Government against Tyson because of concerns about use of illegal aliens. 10:04AM

Q And what was your function in that case?

A To evaluate the work that had been done by an accounting firm for the calculation of damages.

Q Any other work with any of the lawyers in this case? 10:04AM

A No, sir.

Q Did that case for Tysons involve environmental contamination?

A No.

Q What do you know about the Illinois River watershed? 10:04AM

A What I've learned through reading the complaint and the other documents that have been in this case.

Q That have been provided to you by counsel? 10:04AM

A Yes, sir.

Q Have you ever been to the Illinois River watershed?

A I'm not sure because it's kind of a broad area, so I have to assume that I have at some point. 10:05AM

Q Have you been to any location within the Illinois River watershed?

A Not that I can think of or name.

Q Have you taken any car trips, for example, that would show you the Illinois River or Lake Tenkiller? 10:05AM

A No.

Q Have you looked at any streams that might be within the Illinois River watershed?

A No. 10:05AM

Q Have you looked at any areas where there are chicken houses in the Illinois River watershed?

A No, sir.

Q Do you -- would you recognize a poultry house if you saw one? 10:05AM

A The one on my farm.

Q You have a poultry house on your farm?

A I do.

Q Do you grow poultry for commercial purposes?

A No. 10:05AM

Q So what does your poultry house on your farm look like?

A Well, it's an -- I'm amazed that the chickens don't sue me. It's a small --

Q Plenty of lawyers here in the room that could 10:06AM

give them their card I guess.

A Yeah, yeah.

MR. TODD: I object.

A If there are fewer than ten chickens, is that sufficiently numerous for a class action? 10:06AM

Q So you have a poultry of maybe ten chickens?

A Yeah. It's not a big -- it's not a big combine.

Q Do you understand the size of the operations -- 10:06AM

A Oh, certainly.

Q -- of poultry growing? What size of operations do the poultry have in this particular case?

A Well, we're talking about thousands of chickens in a very condensed area. 10:06AM

Q And that's not how you grow them?

A No.

Q So when I refer to a poultry house, I'm talking about the poultry houses that are used by the defendants to grow their chickens. 10:06AM

A Specificity is important, sir.

Q Okay. So have you -- would you recognize one of those types of poultry houses if you saw it?

A I would in this because there are a couple 10:06AM

down the road from my farm that are for other poultry growers.

Q Do you know what the different land use types are in the Illinois River watershed; for example, do you know the percentage of forest versus grazing versus urban -- 10:07AM

A No, sir.

Q -- land use? Do you know what the potential sources of phosphorus are in the Illinois River watershed, that is, phosphorus contamination in ambient waters? 10:07AM

MR. TODD: Object to form.

A No, sir.

Q Okay. Let me make sure I restate the question because that was probably a very good objection. Do you know the sources of phosphorus in surface waters in the Illinois River watershed? 10:07AM

A Do I know all the sources or just any of the sources?

Q Have you did a study of the sources of phosphorus in the Illinois River watershed? 10:07AM

A I have not done a study.

Q What about bacterial sources in the surface waters in the Illinois River watershed; are you familiar with the bacterial sources in such waters? 10:08AM

A I have not done such a study.

MR. PAGE: Why don't we take our break here.

VIDEOGRAPHER: We are now off the Record. The time is 10:07 a.m. 10:08AM

(Following a short recess at 10:07 a.m., proceedings continued on the Record at 10:16 a.m.)

VIDEOGRAPHER: We are back on the Record. The time is 10:16 a.m. 10:16AM

Q Dr. Cowan, can we agree that when I use the term IRW, I'm referring to the Illinois River watershed?

A Yes, sir.

Q Thank you. What do you know about the hydrology of the IRW? 10:16AM

A I can't claim to have any specific knowledge of the hydrology.

Q Do you have any understanding of how contaminants move in the environment of the IRW? 10:17AM

A I haven't studied that.

Q Have you made that a study in any of your other -- in any of your other professional work?

A Well, as we discussed before, I had to study that in the toxic tort cases, at least the 10:17AM

groundwater contamination cases, because I needed to understand where the groundwater flows were occurring.

Q Okay. In this case you did not do any such evaluation? 10:17AM

A I was not asked to.

Q Okay. Was it not important to your evaluation in this case, such as similar to the toxic tort cases, for you to have an understanding of how contaminants move in the environment? 10:17AM

A No, sir. My role in this case is completely different.

Q Do you agree that the primary means of disposal of litter used in poultry production is land application? 10:17AM

A I have no opinion on that, sir.

Q So you don't have any understanding of that whatsoever?

A That's not what I said. I said I have no opinion on that. 10:18AM

Q Okay. Do you have an understanding of how poultry waste is disposed?

A No, sir, I have no opinion on that.

Q Do you have any understanding of how long poultry waste has been applied in the IRW? 10:18AM

A No, sir.

Q Do you feel like you have expertise in general concepts of fate and transport of contaminants in the environment?

A I don't know how to answer that question because it's so broad. Could you ask it a different way? 10:18AM

Q Okay. Do you agree that rain falls within the land surface area of the IRW?

A Yes, sir, I believe rain falls. 10:18AM

Q Okay. Do you understand what the term means surface runoff?

A I have a general pedestrian understanding of the term, yes.

Q Have you ever done any professional study of surface runoff from lands? 10:19AM

A If we could combine -- confine your question to environmental studies, no, I have not.

Q Okay. Have you done any professional work on the area of infiltration of waters? 10:19AM

A I'm sorry, could you define infiltration?

Q Well, would you agree that infiltration means the downward movement of precipitation water through soil?

A Well, that's one meaning. So if that's what 10:19AM

would start with the USDA data and then determine what the estimation procedures were that were used applied to that data to estimate for the two counties you said for a ten-year period, and let me also say that it's entirely possible, given the way the USDA does sampling, that they have perfectly reasonable samples within those two counties, but I wouldn't know without going to the USDA and reading through everything that the USDA publishes to figure out whether they're sampling in those two specific counties or if you're talking about census data or if you're talking about a procedure called borrowed strength or James Stein estimation, James Stein, S-T-E-I-N. 10:37AM 10:37AM

Q If -- **10:37AM**

A Excuse me, I'm not done. That would allow me to then make the estimate. So I'm having trouble with your questions because they're so broad and there's so many different possibilities.

Q If you let me interrupt, maybe I can narrow it. **10:38AM**

A Thank you. I was done.

Q Have you done any evaluation of the USDA animal production data in Arkansas or Oklahoma with regard to poultry, cattle, swine? **10:38AM**

66

A No, sir.

Q Have you ever used principal component analysis in your professional work?

A Yes, sir.

Q Could you explain to me in general terms the applications in which you've used principal component analysis? **10:38AM**

A Sure. Do you want a short list or the full list?

Q Could you kind of categorize how you used it? **10:38AM**

A Sure. Remember earlier we were talking about my graduate students?

Q Yes.

A My most recent graduate student is using principal components analysis on a survey conducted in Honduras to look at -- she's conducting a behavioral analysis to determine whether she can find ways to help workers stem the flow of multidrug resistant Tuberculosis in the Honduras. 10:38AM

Q I'm going to apologize for interrupting. **10:39AM**

A You bet.

Q But can you tell me applications where you used PCA in your own work, not maybe working with someone else? For example, have you done any studies yourself where you've used principal component analysis? **10:39AM**

67

A Okay. Just to conclude what I was saying, however, I will say that I consider that my own work. I'm advising a doctoral student, but if you're asking me if I've done the work as opposed to working with somebody else, actually the very first work that I did was for the National Science Foundation doing an analysis of economic data for a country to determine sort of sources and flows of income and how the economy within that country operated, somewhat like the structure of our own national income accounts. 10:39AM 10:40AM

Since then I've used principal components, for example, in a -- in studies of samples of people to determine whether or not you could use principal components and its adverse Mahalanobis distances for sampling purposes for construction of samples using controlled selection. I've used it in a financial context where we've looked at, for example, stock data. You've got lots of different types of stocks, and the question is if you are trying to invest in stocks, how do you classify them together or apart and is there a more efficient way to classify stocks relative to other methods of creating equity within a firm? Those types of analyses are to determine 10:40AM 10:40AM 10:41AM

68

the structure of financial markets. So a lot of different applications.

Q So has your work in the -- with PCA been primarily involving studies within the social sciences? **10:41AM**

A Yes.

Q Okay. Have you ever done any work with PCA in the non-social sciences?

A That seems so harsh. We could call them less social. 10:41AM

Q How would you call it?

A I understand what you meant. What are commonly referred to as the hard sciences.

Q Yes, sir.

A Well, only in the sense of deal with it from, you know, pure mathematical, which really isn't the social sciences, but if you're talking about like physics, chemistry and so on, no. 10:42AM

Q Or geochemistry?

A No. 10:42AM

Q What about samples involving environmental contaminants?

A Could you be a little bit more explicit?

Q Well, like in this case where Dr. Olsen was reviewing samples of -- environmental samples and **10:42AM**

69

testing it for different parameters, geochemical parameters; correct?
A Uh-huh.
Q Have you done any kind of PC analysis with a dataset similar to Dr. Olsen's? 10:42AM
A No.
Q Have you published any peer-reviewed articles concerning principal component analysis, whether it's the social or hard sciences?
A Well, there was a report to the National Science Foundation. So they published it, I didn't publish it, although that was a really long time ago, and then there are two papers in my resumT that are -- describe the use of Mahalanobis distances, which is the adverse of principal components, for essentially attempting to do controlled selection -- use of controlled selection methods in sample surveys. 10:42AM 10:43AM
Q And what kind of survey was involved; was it a social sciences survey? 10:43AM
A No. This was for the Bureau of the Census. So it would be in general any of the surveys that they do.
Q People population surveys?
A No, sir. At least half or more of the work 10:43AM

that's done by the Census Bureau is business surveys, surveys of governments, surveys of farms. So surveys on almost anything, but not necessarily people surveys.
Q Okay. I'm sorry. My poor choice of words, but those -- none of those studies involved the data -- hard science data; correct? 10:44AM
A Not the way we were discussing hard science before, no.
Q Did you have to study PCA applications for -- when I say -- maybe it would make it easier if I kind of define environmental sciences. I'm talking about an environment case like we have here. 10:44AM
A Okay.
Q A contamination case. So when I say that, I'm not talking about maybe my sociological environmental, the way I grew up or something like that. I'm talking about contamination-type cases; okay? 10:44AM
A Uh-huh. 10:44AM
Q Did you have to study the use of PCA in environmental analysis before you did the work in this case?
A No.
Q And why not? 10:44AM

A Well, you asked me if I had to study the use of PCA in environmental cases, and I took your have to meaning it was an absolute must to be able to understand PCA. PCA is a common technique that's been used for a very long time, and I've used it throughout my career. So if you're asking me if I had to study PCA, no. 10:45AM
Q Okay. Let me ask you this then: Would you agree that the application of PCA to environmental sciences is somewhat different than when you apply it to the work you've done in the social sciences? 10:45AM
A No.
Q You say it's the same methodology?
A Well, mathematically, the mathematics aren't going to change. 10:45AM
Q You don't think there's any unique attributes of doing work in environmental science data that would be important for you to appreciate prior to evaluating Dr. Olsen's work in this case?
A Well, let me put it in perspective. What Dr. Olsen did was he did his analysis using a program called SysStat, which is one of the programs we use, and SysStat doesn't ask if it's environmental. It just runs the program. 10:46AM
Q Okay, and you're --

A So the mathematic -- I apologize because I interrupted you, but just I wanted to conclude by saying the mathematics are exactly the same.
Q Okay, but in your use of PCA, isn't it important to have an understanding of the types of data that are involved in the PCA analysis in order to interpret that data? 10:46AM
A Well, that's why we reconstructed all of Dr. Olsen's datasets.
Q But did you come to an evaluation and understanding of the type of data that was involved? 10:46AM
A Well, I came to some understanding of the type of data. I'm not putting forth -- myself forth as a chemist, a biologist or anything else, but, you know, when I work with doctors and I design research for them, I'm not putting myself forth as a physician, but that doesn't mean that my work isn't, you know, valuable in terms of understanding the transmission of diseases. 10:46AM
Q Did you do any additional study of PCA applications in environmental forensics prior to doing your work in this case? 10:47AM
A I did.
Q And what did you do?
A Well, I'm sorry. I'd like to amend just the 10:47AM

Q Okay. So isn't your understanding that this data was an example of data that Dr. Johnson was showing for PCA analysis in this table?
A Well, yes, but I just wanted to be sure that I was clear because the problem is that your pages start on Page 214 talking about principal components analysis, but then this table jumps way over to Page 268, so I don't know at that point whether he's still doing principal component analysis or receptor models. So I just want to be sure that I'm clear that I'm talking doctor -- about the use of this data in a principal components analysis, but I can't state that that's what is happening in this part of the chapter because of the gap. 12:26PM
Q I understand. Let's turn to Page 38 through 41. 12:26PM
A Of my report?
Q Yes, sir.
A I'm going to put this out here if it's okay with you. 12:26PM
Q Actually I just got the five-minute tape. We're into the lunch hour. Why don't we take a break now for lunch before I go to a new topic.
A Thank you.
VIDEOGRAPHER: We are now off the Record. 12:27PM

The time is 12:26 p.m.
(Following a lunch recess at 12:26 p.m., proceedings continued on the Record at 1:32 p.m.)
VIDEOGRAPHER: We are now on the Record. 01:33PM
The time is 3:32 p.m.
COURT REPORTER: 1:32 p.m.?
A I don't think so.
VIDEOGRAPHER: 1:32 p.m.
Q Dr. Cowan, before lunch, we were talking about this issue of non-detects. 01:33PM
A Yes, sir.
Q And it's discussed at least in part on Page 26 of your report. Can we go back to that again? I'm trying to understand your opinion in this area that's contained on Paragraph 57. 01:33PM
A Yes, sir.
Q I'm going to read the first two sentences. I want to start there and then work my way down. Does it not say that in your report, in the data analyzed by Dr. Olsen, he also had a number of values that are non-detects, meaning the measurement method used by the researchers cannot measure any trace measure of a chemical or organic value. Rather than treat this as zero, not detected, Dr. Olsen substitutes 01:34PM

the midpoint between zero and the detect limit for the chemical. Did I read that correctly?
A Yes, sir.
Q Okay. Now, you testified before lunch I believe that you're not criticizing Dr. Olsen by using the midpoint between zero and the detection limit when he ran his PCA, correct, for non-detects? 01:34PM
A I agree, I am not criticizing him for not using zero. Using the midpoint between zero and the lower limit of the detection level is an acceptable procedure. 01:35PM
Q And it's common practice in PCA analysis of environmental data using the midlevel point?
A Well, I don't want to offer an opinion specifically to PCA analysis in environmental data. It's a common procedure used in all of statistics. 01:35PM
Q Okay. What do you mean then, the second sentence, when you say rather than treat this as zero non-detected; what does that phrase add to that portion of your opinion? 01:35PM
A Only that the -- I was offering alternatives because if you weren't taking logarithms, then using zero would be a perfectly acceptable method, too.
Q So if you weren't logarithming, you could put zero in there and that would be an acceptable level 01:35PM

in environmental analysis?
A I think you just created a word. If you weren't taking logarithms.
Q Right. What did I say?
A If you weren't logarithming. 01:36PM
Q Well, I like that word.
A Yeah, it was pretty good actually, but I just wanted to make sure we --
Q Is the answer yes to my question?
A I'm sorry, now I don't remember the question. 01:36PM
Q Okay.
A If you weren't taking logarithms?
Q You would say that then zero would be appropriate as a substitution?
A Zero or the non-detect or the method that Dr. Olsen used. 01:36PM
Q Okay. Let's go on after the first two sentences. However, the detect limits can vary from observation to observation for each chemical; correct? 01:36PM
A Yes.
Q In some samples, we would have smaller non-detects than for others, such as .01 as a lower limit for some observations on aluminum and .001 for other lower limits. Did I read that correctly? 01:36PM

THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	)	
Plaintiff,	)	
vs.	)	4:05-CV-00329-TCK-SAJ
TYSON FOODS, INC., et al,	)	
Defendants.	)	

- -

VOLUME II OF THE VIDEOTAPED DEPOSITION OF CHARLES COWAN, PhD, produced as a witness on behalf of the Plaintiff in the above styled and numbered cause, taken on the 18th day of February, 2009, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.

involve the molecular type of analysis that you're talking about. So I know something about it because I have to know something about it being part of the group but not the specifics.

Q Do you understand what PCR is? **11:38AM**

A As I remember, it's a technique that regenerates repeatedly chains of DNA, kind of like a copying machine.

Q So are you familiar with the PCR methodologies? **11:38AM**

A No.

Q Do you know how the PCR methodology affects the sensitivity to low amounts of target DNA?

A No.

Q Do you know what nested PCR is? **11:38AM**

A No.

Q Would you be able to tell us if there's a difference between nested PCR and quantitative or qPCR?

A No. 11:39AM

Q And this may be a little bit of a redundant question but let me ask it anyway. Do you understand that there's a difference in sensitivity between nested and qPCR methods?

A No. 11:39AM

375

Q Dr. Cowan, do you know the state of the art, which I'll define as that accepted by scientists expert in the field of microbial source tracking, for demonstrating sensitivity and specificity of a molecular biomarker? **11:39AM**

A No.

Q And I would assume then my follow-up question is in that state of the art, then you would not know how sensitivity and specificity are calculated?

A If they are calculated in the way that Dr. 11:40AM Harwood describes them, then, yes, I would.

Q Do you know what the state of the art is for calculating sensitivity and specificity for demonstrating those attributes of a molecular biomarker? **11:40AM**

MR. TODD: Object to form.

A I'm confused by your question because I believe it's asking me two different things. So could you ask me a different way?

Q Well, I asked you whether or not you know the state of the art for demonstrating specificity and sensitivity of a molecular biomarker, and you said no; correct? **11:40AM**

A Right.

Q Okay. So my follow-up question was simply, do you know within that state of the art how sensitivity and specificity are calculated? **11:40AM**

376

MR. TODD: Same objection.

A Okay, and the answer to that question is sensitivity and specificity are common terms in 11:41AM statistics and in particular in biostatistics. I don't work in the narrow subfield that you're talking about. I work in the broader field of biostatistics, and I know how to calculate sensitivity and selectivity in biostatistics in 11:41AM general. So if it's -- unless there's something unusual about the particular circumstance that you told me, then, yes, and actually I describe it on a later page.

Q Well, let me ask you this question maybe a little bit different way. Is it -- have you reviewed the literature on molecular source tracking -- microbial source tracking through molecular methods to determine the sampling sizes they use in peer-reviewed papers on that subject? **11:41AM**

A No.

Q Okay. Can you tell us, sir, how many poultry litter samples were tested by Dr. Harwood for sensitivity?

MR. TODD: Object to form. 11:42AM

377

A I don't understand your question. Under the definition that I gave of sensitivity, that question makes no sense.

Q Okay. Let me ask it a different way.

A Okay. 11:42AM

Q Do you know how many litter samples Dr. Harwood tested to identify a unique biomarker from poultry waste?

A Thank you. I need to look.

Q Thank you. **11:42AM**

A I thought I had a table.

Q Do you know the answer, sir?

A I don't recall, and I can't find it in my report.

Q If I said that there were ten such samples, would that refresh your recollection one way or the other? **11:44AM**

A That sounds about right. I mean, that's close to what I remember.

Q Do you recall whether or not all the samples that we're referring to here were all positive for the poultry biomarker? **11:44AM**

A I don't remember.

Q You don't recall?

A No. 11:44AM

378